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single day. One of the other traps used is a cone-shaped affair, constructed much like a wire rat trap, in that when a fish gets into it it cannot get out. Stockades are often used to force fish into these traps. Modern fish traps are also used.

PORPOISE HUNTING. In hunting porpoise a canoe is noiselessly shoved onto the unsuspecting beast, which is harpooned with a heavy weapon, to which buoys are attached, as in whaling, next described. The animal is quick and usually puts up quite a fight for its life, but if the harpoon is once driven deep into its body its capture is sure.

WHALING. The implements used in whaling are a two-ton canoe, innumerable inverted hair-sealskin buoys, harpoon stalks and blades, sufficient rope, and plenty of knives.

After elaborate ceremonies to make the whalers "not afraid," the whaling crew—or crews, as usually from five to seven whaling canoes go on a whaling trip—pushes out into the ocean. Seeing a whale spouting, they push their canoe noiselessly onto the unsuspecting animal, and before it is aware of their presence a huge harpoon, to which a rope of buoys is attached, is driven deeply into its body. It dives and comes to the surface dragging the buoys after it, only to be attacked again. Thus is the contest kept up till the beast floats lifeless. It is then towed ashore and cut up. Both the meat and blubber and much of the bone is saved, the last being made into knives, spears and harpoon points in the old times. At the close of caring for the valuable parts, a give-away feast and dance of four days' duration is given in the *pollatch* (city) hall of the village and all are made happy.

Frogs and Frogging.

E. C. O'ROKE.

Out in Wyoming the ranchmen have a friendly card game called solo, which is so fascinating that were it played in the daytime and participated in to a greater extent by the female of the species it would rival auction bridge as a time killer. A favorite bid in solo is "I frog." Having sat in and sat out in these friendly games—for sitting out while others sit in is part of the fun—the writer can vouch for the enjoyment that the players experience. But whether the question of frogging is what makes the game attractive should be left to the psychologists. However, be that as it may, frogging in the real sense is a sport that has the proverbial snipe hunt beaten a long way, and the evolved cave man who has not felt with his bare hands the cold, slippery body of a frog and held the croaking creature firmly throughout all his efforts to escape does not know the supreme thrill of achievement that comes to the successful hunter.

Many books have been written about frogs, and in them the amateur or the investigator can find many of the finest things in modern biology. But as far as frogging is concerned, a search through literature reveals the meagerness of our information concerning this popular sport.

"How far can a frog jump?" is often asked in laboratory outlines for the study of this master servant of biology. The student in his zeal to answer

the question takes a tired laboratory specimen, urges it onward by a few variously applied stimuli, and comes to the conclusion that twelve inches represents the extreme effort of a frog in this characteristically froglike method of locomotion. Had he gone frogging instead, and happened to come across an adventurous and well-fed *Rana pipiens* a couple of rods from water, and headed towards that universal commodity on a slightly inclined plane, doubtless his answer would have been different; if also the *Rana pipiens* had been *Rana catesbeiana* instead, and this individual had had a straightaway course over firm mud, the frogger might well have answered, with greater scientific accuracy, several feet, and any inaccuracy of statement could have been checked up by the bullfrog's written record in his own handwriting.

Frogging offers splendid opportunities to learn of the habits of these most common amphibia. The writer's earliest recollections of the sport concern a group of small boys and some small spotted frogs. The frogs jumped into the water, and so did the boys; in fact, they buried themselves in the mud, and the boys in attempting to catch them came very near doing likewise. Result: a catch of three small frogs and prospects of catching a licking on the part of three small boys. The next time the writer went frogging he had a twenty-two rifle, but he had not learned that a frog is supposed to have a medulla. Result: three small frogs as before, and the remarkable scientific deduction that you can kill a frog by shooting clear through him, but he won't die.

Frogging, like many other things, depends upon the time and place. The object that the collector has in mind is also important. For instance, if it isn't frogs but frog eggs that the investigator wants, he must be ready to go collecting at the first call of spring. The breeding season of the *Salientia* varies with the climate, and is announced by the croaking of the frogs as early as March and February in some localities and not until May or June in others. In fact, the writer has found twelve-millimeter toad tadpoles, probably *Bufo lentiginosis woodhousei* as late as July 19 in high mountain regions in Wyoming.

Since frog eggs and developing larvæ can be shipped easily, a knowledge of the time of their appearance in various localities would be extremely useful to the investigator in experimental zoölogy who might want to keep on hand small larvæ at various times of the year.

In collecting frog eggs for preserving for cleavage studies, it is necessary to go before sunrise in the morning if one wishes to secure the earliest stages. The writer has found it good practice to take along several shallow containers and a bottle of formalin. Upon finding the egg masses it is but the work of a few moments to identify with a good hand lens the stage of development of the eggs. They can then be put in the shallow pans of water and allowed to develop to the proper stages before being fixed. By this means the writer has been able in a few days to secure large numbers of complete series of early stages, which at biological supply-house prices would be worth several hundred dollars. The later stages of cleavage and early embryos, as well as tadpoles of different ages, can be readily obtained by taking these early stages to the laboratory and allowing them to develop to the desired stage.

A note as to where frog eggs are most likely to be found may not be amiss. The little *Chorophilus* eggs, though small, make beautiful cleavage studies.

They can be found very readily in temporary pasture ponds where there are old sticks and grass or weeds to which the eggs may be cemented. These egg masses are elongate, rarely more than an inch or two in length, and quite transparent. The egg masses of the leopard frog, on the other hand, may be as large as one's fist, and are very dark in color, due to the pigmented upper half of the eggs. Consequently these egg masses are harder to find, especially in murky water or against a dark background. They are deposited in deeper water than those of the *Chorophilus*, usually at a depth of from eight inches to a foot. Quiet water, such as drainage ditches in open flats, offers good opportunities for collecting. In the Laramie valley in Wyoming the best place to find *Rana pipiens* eggs is in the low flats near the river, which become filled with water during the spring overflow. Perhaps this choice of environment on the part of the frog has a good deal to do with the preservation of the species, for the spring overflow, being the result of melting snows in the mountains, does not come until the country has warmed up in general. When this overflow once arrives the low places become pools of stagnant water, which last for several weeks. They develop a rich supply of food for the developing tadpoles, and thus the chances for the preservation of the species are optimum.

Perhaps the best-known method of collecting frogs is that of blinding them at night by means of a flash light or acetylene bicycle lamp. With the light in one hand, the collector walks quietly up to the edge of the pond where the frogs are sitting with their heads out of the water. He brings the light down to within a few inches of the frog's eyes, at the same time allowing the other hand to close quickly and firmly over the unsuspecting prey. A gunny sack is the rest of the necessary equipment, and like the proverbial snipe hunt, it works better if you take some one along to hold this container. The use of a small hand net instead of the bare hand may insure a larger percentage of safe catches. The loss of a frog or two in itself is not serious, but when one jumps away he frequently gives a fear call that frightens others near by that might have been legitimate prey. This method of collecting has netted the writer dozens of large bullfrogs in ponds such as those at the State Fish Hatchery at Pratt, Kan.

When bullfrogs or other large frogs are desired for food or for examination for feeding habits or parasites, and where it is not necessary to take them alive, shooting with a twenty-two rifle is effective. This method works well in the early morning when they are too alert to be captured in a net. It is needless to say that frogs must be shot through the brain.

Fishing for bullfrogs with a long bamboo pole and short weighted line baited with only a hook and a piece of red flannel is another method of catching these largest of frogs. The fisherman sees a frog sitting on the bank, and sneaking up from behind, swings the bait in front of the game. When the creature leaps and grabs it all the fisherman has to do is to swing him quickly to a place of safety.

In the lake regions of the northern United States in the fall before the shallow lakes freeze over, frogs congregate in enormous numbers about the edges of the lakes, and leaving the water temporarily, crawl into cracks and crevices in the banks and about the roots of trees. Under such circumstances one can readily obtain any number of them. Last fall the writer was

introduced to this kind of frogging on the shores of Lake Campbell, near Brookings, S. D. Leopard frogs of all sizes were to be found literally by the thousands. All one has to do is to reach his bare hand into the holes and pull them out by the handfuls. What an opportunity for obtaining large numbers for laboratory use or for examination for parasites! So far as the writer knows, the only use that is made of them in the above-mentioned locality is that picnic parties go out to the lakes and enjoy a mess of frog legs in season.

Thus in brief are a few pointers on frogs and frogging gleaned from the writer's field notebook. They are submitted for publication in the hope that others will find them worth while.

The Industrial Research Movement of To-day.

W. F. FARAGHER.

The ambition of every healthy business is growth. Whatever may be the chief motive which impels an individual concern towards this goal, it is certain that a desire to render the largest possible measure of service to society is a salient factor in its program of development. For the firm typical of the times, the mercenary aspects of this principle are recessive. With the more general adoption of this method of conducting, results of a revolutionary character will be achieved, and the establishment of our national commercial activities upon an unassailable foundation assured.

The importance to our nation of a fully developed, virile manufacturing activity cannot be overestimated. Not only must the diversified needs of our own people be cared for efficiently, but also the requirements of foreign markets must be supplied in as large measure as is possible in view of the many handicaps which we suffer. We have been too long content to control the balance of trade by the exportation of raw materials and of commodities the value of which has been only slightly increased by fabrication. We should, particularly at this period of readjustment of world commerce, strive to put ourselves in a position to furnish, in competition with the world, articles which have increased value because of their uniqueness in meeting man's requirements or because of the skill and outlay expended in their preparation.

It is not difficult to show that most of our successful and desirable innovations in industry have been developed around invention and scientific experimentation or research. Formerly no close distinctions were drawn between these two functions, as a rule. Very frequently, also, the invention or research was not directly associated with the business which reaped the reward. We may now, however, assert that all properly planned and properly executed research is remunerative. Furthermore, it is now established that any technical business which wishes to expand as it should must in some way avail itself of technical, *i. e.*, chemical and engineering, research. In the sense here intended, research covers all activity which looks toward the application to a given factory process or product of any available chemical or engineering knowledge not currently employed in connection with them.

The business world has for a long time been familiar with various methods of insuring against discontinuance in the face of certain disasters—insurance